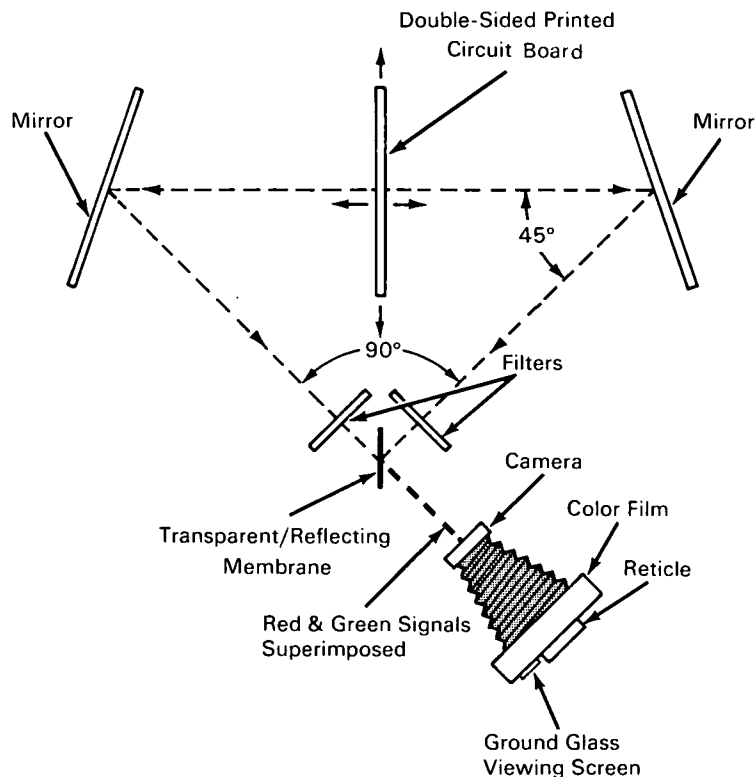


NASA TECH BRIEF



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Optical System Facilitates Inspection of Printed Circuit Boards



The problem:

To provide a means for accurately determining the quality and registration of surface features of double-sided printed circuit boards. Present methods for visual inspection of these attributes on printed circuit boards, using magnifying devices and a reticle, are slow and tedious, particularly for high-density circuits. An X-ray superimposition method, which has been used, does not register the images from both sides of the board with sufficient accuracy for reliable inspection.

The solution:

An optical comparator method by which color-coded superimposed images of both sides of a printed circuit board are presented to view, clearly showing details and registration of the circuitry.

How it's done:

Light sources are arranged to illuminate each side of the printed circuit board. Surface features of the circuitry are reflected by the two mirrors to primary

(continued overleaf)

(for example, red and green) color filters. The color-coded images are superimposed by the transparent/reflecting membrane (half-surface mirror) and pass into the camera lens. In the camera, the superimposed images can be focused onto a ground glass screen and viewed actual size or under magnification. A calibrated reticle, capable of various magnifications, can be used to measure image details. The superimposed images can also be photographed on color film (or high resolution black and white film) to provide a permanent record for viewing directly or as a projected, enlarged image. Rapid scanning of the superimposed images on the ground glass screen will immediately bring out deviations from proper registration and surface details of each side of the printed circuit board. The screen displays a dominant color mixture for features in registration and a discrete primary color (depending on the two filters used) for features which are not in precise registration.

Notes:

1. Various modifications of the basic method are possible. These include the use of rotating optical devices, stroboscopic lights, prisms in place of plane mirrors, and the use of colored lights instead of filters.
2. This method would also be useful for comparing other types of surface features on opposite faces of a panel. Inquiries concerning technical details may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland 20771
Reference: B68-10021

Patent status:

No patent action is contemplated by NASA.

Source: M. Cridlin and J. O'Connor
(GSC-07971)